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Invertebrate animals as a component of the traditional medicine trade in KwaZulu-Natal, South Africa

by

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ABSTRACT

This paper summarises the results of a survey undertaken to investigate the use of invertebrate animals in the traditional medicine trade in KwaZulu-Natal. An inventory of the invertebrate taxa on sale in the traditional medicine market in Durban is provided. The nature and origin of the material are discussed and issues relating to conservation are considered. Much is either collected dead or obtained as by-catch from other unrelated activities/industries. Some concern is expressed in relation to the conservation of the mollusc *Chiton salihafui* in Zululand, and the coral *Tubipora musica* and large tropical echinoderms in Mozambique. Monetary values of the products (Rand/kg) are generally high compared with those of plants, but no figures on utilisation levels are available. Examples highlighting the cultural significance of the animals are given and the importance of symbolism in relation to use is emphasised. The Zulu names for some of the organisms are discussed in relation to folk systematics, classical Linnaean nomenclature and modern taxonomic practices.

> ‘*African slugs are very useful in dysentery; five are burnt and taken with half a denerius by weight of gum acacia; of this ash two spoonfuls are given in myrtle wine, or any dry wine, with an equal quantity of hot water.*’
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> Pliny the Elder, *Naturalis Historia*, book xxx, section xix, para 56. Ca AD77

INTRODUCTION

Whereas ethnobotanical research is now a major field of scientific endeavour, ethnozoology is very much its poor relation. Ethnobotany has prospered because it has much downstream relevance and potential in the health and economy sectors, particularly associated with herbal medicines. It also has potential to contribute to the upliftment of rural communities, through the equitable acknowledgement of intellectual property rights and the development of small-scale economic enterprises. At this stage, similar beneficial applications of ethnozoological research are less apparent and as a consequence the subject has received less attention. Nevertheless, animals feature significantly in traditional southern African cultures (Junod 1927, Berglund 1976) and are often utilised by traditional healers on account of their perceived magico-medicinal properties. Research in this field has interesting zoological, anthropological and sociological components, and there are also issues of concern regarding the conservation of some of the species used. Furthermore, it is evident that invertebrates, particularly marine ones, represent a rich source of potentially useful natural products, ranging from anti-cancer agents and anti-malarials to anti-fouling substances (Ireland *et al*. 1988, Clare 1996, Mayer 1999, Fingerman & Nagabhushanam 2001, Higa *et al*. 2001). Bio-prospecting in the marine sector is an important research field with practitioners already active in South Africa (Davies-Coleman 1996). Ethnozoological research has potential to provide important leads to guide bioprospectors in their search for useful bioactive compounds (Fourie, Swart & Snyckers 1992, Scheuer 1988, Wynberg & Laird 1997).

Cunningham and Zondi (1991) investigated the broader perspectives of animal use in traditional medicine in southern Africa and McKean (1995) provided a directory of animal taxa utilised in KwaZulu-Natal. Simelane (1996) examined the use of vertebrates (excluding fish) by the Xhosa of the eastern Cape, in particular the conservation implications of this with regard to Red Data species (Simelane & Kerley 1998), and Derwent and Mander (1997) explored the use of birds in traditional medicine in KwaZulu-Natal, highlighting some of the environmental, social and economic issues involved. Bossard (1996) has also recorded the use of a number of animal products in Angolan traditional medicine. Earlier texts specifically relating to Zulu traditional medicine (Bryant 1966) focus almost exclusively on plant medicines, mentioning animal medicines only in passing. The bulk of animal products used are of vertebrate origin, but Cunningham and Zondi's report (1991) also indicated the presence of an invertebrate component.

The purpose of the present study was to investigate the use of invertebrate animals in the traditional medicine trade in the Durban area and to examine some of the ethnological perspectives associated with this. The study was concerned not only with the use of these animals as medicines *per se,* but also as symbols and items of regalia within the traditional healers' domain. The survey was essentially a snap-shot assessment of invertebrate usage in the Warwick Triangle traditional medicine market in Durban, designed to establish the spectrum of taxa involved and to investigate their uses by the healers, the sources of supply, the economic value, the scale of utilisation and the conservation implications. This market is the largest collective traditional medicine outlet in KwaZulu-Natal, and Mander (1998) has indicated that it can be taken to be broadly representative of traditional medical practices in KwaZulu-Natal as a whole. At the time of the study (1997) the market was located primarily in Russel Street and Leopold Street, but has subsequently been relocated to a nearby unfinished road fly-over. Although essentially a typical African informal market, the traders have elected a body, 'The Russel and Leopold Streets Muthi Traders Committee', to represent their collective interests.

METHODS

In order to legitimise and facilitate the study, and to allay fears and suspicions amongst the traders, we first sought permission to conduct our survey from the 'Muthi Traders Committee'. After discussing the nature and scope of the study, the committee agreed to support the project and to assist in the interviewing of traders. A simple questionnaire, designed to gather appropriate data was approved, with the exception of questions relating to the medicinal use of the animal products. The committee members considered that this was a controversial issue, which traders might view as compromising their livelihoods and intellectual property rights, and which they could thus not sanction. Furthermore, since animal products are often believed to have strong magico-medicinal properties that can be used for

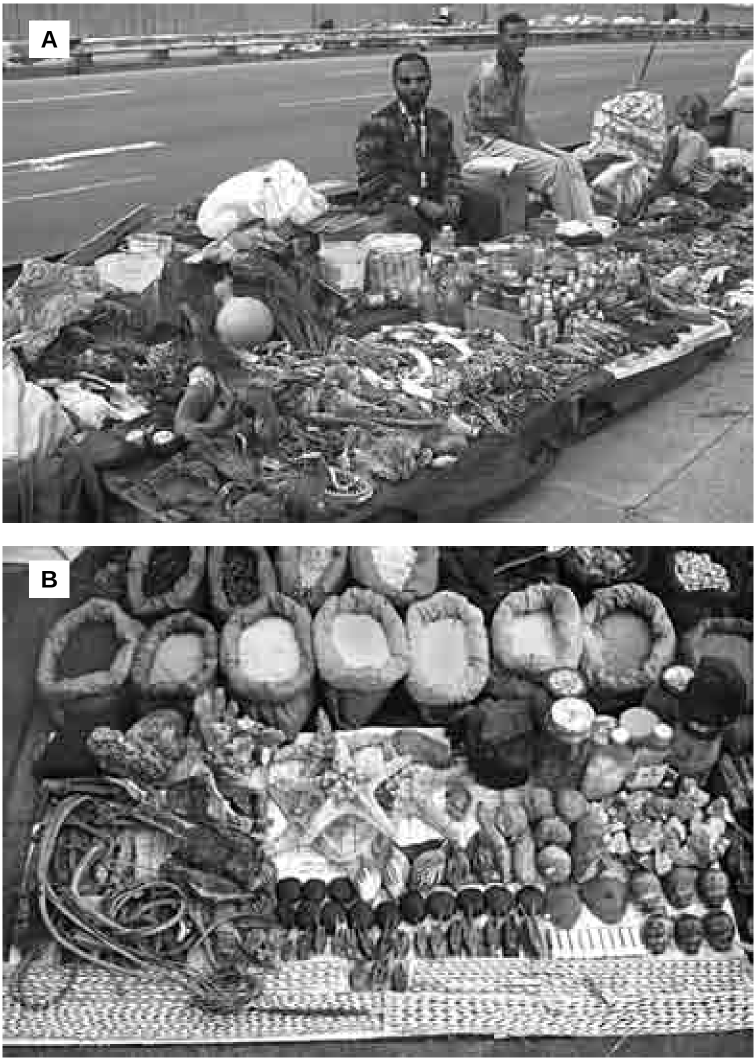

Fig. 1. Stalls in the Warwick Triangle market, Durban. A, typical stall selling a wide range of products, nearly all of animal origin; B, neatly organised stall of a Mozambican trader, displaying a range of animal products, many of tropical origin. Note *Cypraea annulus* head-bands in foreground.

evil as well as for good, the committee members felt that knowledge regarding the use of such products ought to be kept, as far as possible, in the hands of trained practitioners only. Acknowledging the sensitivity of the issue we were thus obliged to omit questions concerning medicinal usage.

The survey was conducted during July and August, 1997. All interviews with traders were conducted in Zulu, with one of us (N. Mkhize) and a committee representative acting as interpreters. The interviews were informal and the questionnaire was completed by ourselves, based upon the information provided by the stall holders and our own examination of the material for sale on the stalls.

RESULTS

Stalls

Two broad patterns emerged. Firstly, that stalls generally sold either plant or animal products (Fig. 1), rarely both. If both were on sale then it was usually a case of there being a large amount of one type and a few isolated items of the other. Secondly, stall holders selling primarily animal products were male, whereas nearly all stalls offering plant material were run by women. The number of stalls with mostly animal products for sale was 30, representing 10% of the approximately 300 stalls in the entire market (Mander 1998).

Diversity of taxa used

Invertebrate taxa belonging to seven different phyla were available on sale (Table 1). The level of taxon discrimination at which the traders operate is variable and therefore we list the material as it is sold in the market. It is not possible to give a detailed species-level inventory of all the taxa used, as this would in some cases have necessitated the purchase of a substantial amount of the stock in order for samples to be sent to specialists for identification (particularly in the case of Cnidaria and Porifera). Items such as coral blocks and chitons may include several genera or species. For example, whereas the coral genera *Tubipora* and *Fungia* are relatively distinct and may be perceived to have properties peculiar to themselves, it is evident that healers do not discriminate meaningfully between beach-worn coral blocks belonging to the genera *Pocillopora*, *Favites* and *Porites* or even between these and colonies of the gastropod *Dendropoma*, all of which are known as *isisefo* (a sieve). Similarly, echinoids of the genera *Diadema* and *Echinometra*, and the chitons *Chiton salihafui* Bullock, 1972, *Dinoplax* sp. and *Onithochiton literatus* (Krauss, 1848) are sold in mixed lots (Fig. 2A). Marine gastropod shells (*umnenke*) are generally sold without concern for the species. The entry 'mixed marine shells' in Table 1 comprises a wide range of molluscs, belonging to the gastropod families Bursidae, Conidae, Cypraeidae, Fasciolariidae, Haliotidae, Muricidae, Naticidae, Neritidae, Olividae, Patellidae, Ranellidae, Trochidae, Volutidae, and the bivalve family Ostreidae.

There appears to be little or no discrimination between these and they are mostly available as mixed lots, the purchaser deciding which he/she requires. Species discrimination is more acute in the case of certain cowry species (*Cypraea*), which are sold in monospecific lots and often given different, more specific Zulu names, e.g. *impambha* for the ring cowry, *Cypraea annulus* Linnaeus, 1758 (Fig. 2B). Although also known as *umnenke*, terrestrial snails (invariably Achatinidae) are generally kept separate from marine ones, but no distinction is made between different species involved (*Achatina immaculata* Lamarck, 1822 and *Metachatina kraussi* (Pfeiffer, 1846)). Some products were available both as intact specimens and as broken up fragments (*Echinodiscus* and cuttlebones).

Some additional items were seen including dried specimens of what appeared to be pulmonate sea-slugs of the genus *Peronia*, as well as some large beetles (?Curculionidae). However, the stall holder selling these items was uncooperative and even hostile toward us, believing that we were agents of the police force or conservation services. We could thus neither examine the specimens closely nor request further relevant information.

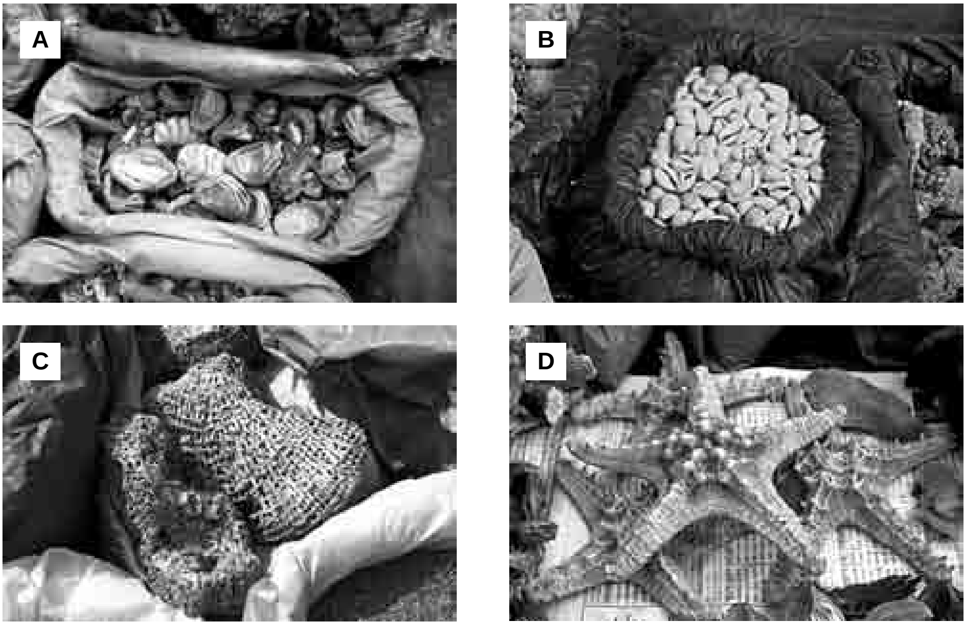

Fig. 2. Samples of invertebrate animals for sale in market. A, dried, live-collected chitons of the genera *Chiton*, *Dinoplax* and *Onithochiton*; B, ring cowries (*Cypraea annulus*), many with dried bodies inside; C, organ-pipe coral (*Tubipora musica*) from localities as much as 2000 km distant in northern Mozambique; D, starfish (*Protoreaster lincki*) collected alive in sheltered localities in Mozambique.

Origin of the material

The bulk of the material for sale was of marine origin and was reportedly gathered locally or at least within the province of KwaZulu-Natal. However, a significant component originates in Mozambique, including tropical forms such as the coral *Tubipora musica* Linnaeus, 1758 (Fig. 2C) and the larger asteroid echinoderms (Fig. 2D), as well as taxa also occurring locally, such as *Cypraea annulus* and *Spirula spirula* Linnaeus, 1758. In addition, a number of gastropod molluscs evidently originated in the southern or western Cape, for example certain fasciolariid whelks (e.g. *Fusinus ocelliferus* (Lamarck, 1816)) and large patellid limpets (*Scutellastra* spp.). In the great majority of cases the material was collected by persons other than the stall holder.

Consumption levels and monetary value

Responses to questions regarding the economics of the trade in invertebrate medicines proved to be problematic. Answers relating to frequency of use were variable and difficult to quantify, ranging from ‘often, but not every day’ to ‘2–3 times a week’ or ‘rarely’. We were unable to elicit responses more precise than this in the short time available.

Nevertheless, some indication of the monetary value of the products can be obtained from comparison of price per kilogram (dry weight) figures (Table 2). Using this measure, the items of highest value were small chitons, pill millipedes and *Spirula* shells, all costing R300–500[1] /kg, with several other items costing R100/kg or more.

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[1] In mid 1997, US$ 1.0 = SA Rand 4.80

TABLE 1.

List of invertebrate taxa on sale in Durban traditional medicine market. Prices were not available for some items either because the stall holder was absent or the material was not sold as individual pieces. The Live/Dead column refers to the condition of the material when harvested; $*$ In mid 1997, US$ 1.0 = ca SA Rand 4.80; $^{\#}$ Taxon also recorded by Cunningham and Zondi (1991); † Zulu name recorded by Cunningham and Zondi (1991); $^{@}$ Strictly speaking *umnenke* refers to a snail and *igobolondo* to a shell, but traders seemed to use *umnenke* also for empty shells, marine and terrestrial; ¶ Name recorded by McKean (1995).

Phylum: Group	**Species**	**Live(L)/ Dead(D)**	**Unit Price (SA Rand)***	**Zulu name**
Porifera	Unknown	L	-	-
Cnidaria: Stolonifera	organ-pipe coral (*Tubipora musica*)	?L	5.00/piece	*isisefo*
Cnidaria: Scleractinia	beach worn coral blocks (*Pocillopora*, *Favites* and *Porites* spp.)	D	1.00-3.00/ block	*isisefo* or *iphakama lasolwandle*
Cnidaria: Scleractinia specimen	mushroom coral (*Fungia* sp.) *ikhowa lasolwandle*	?L	5.00/	
Cnidaria: Gorgonacea	mixed gorgonians	L	2.00-5.00/ handful	*isiwome, isikhuningomile,* or *is'khuningomile*
Annelida: Polychaeta	*Gunnarea/Idanthyrsus* (tubes)	D	2.00/block	*umuhlwa wasolwandle*
Mollusca: Polyplacophora	mixed$^{\#}$ (*Onithochiton literatus*$^{\#}$, *Chiton salihafui* and *Dinoplax* sp.)	L	0.5-5.00 (small -large) each	*imfinyezi* yasolwandle or *imfinyezi welulwandle*†
Mollusca: Gastropoda	mixed marine shells$^{\#}$	D	2.00-5.00/ handful	*umnenke* or *amagobolondo@*
Mollusca: Gastropoda	*Dendropoma* sp.	D	2.00/block	*isisefo*
Mollusca: Gastropoda	*Cypraea annulus*	L+D	5.00/hand-ful	*impambha*
Mollusca: Gastropoda	*Cypraea arabica*$^{\#}$	D	2.50-5.00 each	*imbazo*
Mollusca: Gastropoda	*Cypraea tigris* Linnaeus, 1758$^{\#}$	D	10.00 each	-
Mollusca: Gastropoda	*Fusinus ocelliferus*	L+D	2.00-3.00 each	*umnenke*
Mollusca: Gastropoda	Achatinid snails (*Achatina immaculata* and *Metachatina kraussi*)$^{\#}$	D	2.50-3.00 each	*umnenke*

TABLE 1 (continued).

Phylum: Group	**Species**	**Live(L)/ Dead(D)**	**Unit Price (SA Rand)***	**Zulu name**
Mollusca: Cephalopoda	*Octopus* sp.[#]	L	10.00 each	*ingwane* or *imbambela*[†] [*imbambezela*]
Mollusca: Cephalopoda	*Nautilus* sp.	D	-	*isidumo*
Mollusca: Cephalopoda	cuttlebone[#] (*Sepia* sp.)	D	2.00 for two	*amasimbenyanga*
Mollusca: Cephalopoda	*Spirula spirula*	D	5.00/hand-ful	*isongololo lasolwandle*
Arthropoda: Diplopoda	pill millipedes[#] (*Sphaerotherium* sp.)	L	0.50 each	*imfinyezi yentaba*, *imfinyezi yangaphandle* or *imfinyezi wehlathi*[†]
Echinodermata: Asteroidea	?*Pentaceraster mammillatus* (Audouin, 1826)	L	5.00-10.00 each	*inkanyezi yasolwandle*
Echinodermata: Asteroidea	*Protoreaster*[#] *lincki*	L	5.00-10.00 each	*inkanyezi yasolwandle* or *usimongotho*[†]
Echinodermata: Ophiuroidea	*Astrocladus* (broken pieces)	L	2.00/hand-ful	-
Echinodermata: Echinoidea	*Echinodiscus bisperforatus*	L	2.50-5.00 each	*ipuleti lasolwandle*
Echinodermata: Echinoidea	purple/black urchins[#]	L	1.00-5.00 each	*umopho wasolwandle* or *usimongotho*[†]
	(*Echinometra mathaei* and *Diadema* sp.)			
Chordata: Ascidiacea	red-bait (*Pyura stolonifera*)[#]	L	1.00-2.00/ piece	*isenene*
Other	fossil ammonites	D	-	*insoga*[¶]
Other	mixed intertidal debris (beach-drift)	D	2.00-5.00/ handful	*izikhukhula zolwandle*

TABLE 2.

Unitary quantity, price and calculated value [in SA Rand/kg dry weight] for some of the invertebrate items most commonly for sale. These are derived from specimens actually purchased, for which the unit price may not reflect the variation indicated in Table 1. [Mid 1997 U$1.00 = R4.80.]

Item	**Unit**	**Unit price (SA Rand)**	**Unit weight (g) (approximate)**	**R/kg**
Coral blocks	1 piece	1.00	350-400	2.50-3.00
Cuttlebone	2 whole	2.00	80	25
Red-bait	3 pieces	5.00	115	43
Echinometra mathaei	1 whole animal	2.00	27	74
Cypraea annulus	1 handful	5.00	60	83
Protoreaster lincki	1 whole animal	10.00	100	100
Echinodiscus bisperforatus	2 whole animals	5.00	50	100
Diadema sp.	1 whole animal	5.00	40	120
Gorgonians	1 handful	5.00	33	150
Dinoplax sp.	1 whole animal	5.00	30	166
Tubipora musica	1 piece	5.00	25	200
Small chitons	1 whole animal	0.50	1.67 (mean)	300
Pill millipedes	1 whole animal	0.50	1.6 (mean)	312
Spirula spirula	1 handful	5.00	10-12	400-500

Another variable, possibly indicative of consumption levels, is the amount of material available for sale in the market. No one product was available on all stalls, but the following broad groups were among the most commonly available, suggesting higher utilisation levels: asteroids, echinoids, gorgonians, coral blocks, chitons, cuttlebones, achatinid land snails, mixed marine gastropods and red-bait. The following taxa were seen on five or more stalls: *Tubipora musica*, *Pyura stolonifera* (Heller, 1878), chitons (mixed), *Cypraea arabica* Linnaeus, 1758, *C. annulus*, sea-urchins (mixed), *Protoreaster lincki* (de Blainville, 1830). The quantities available on each stall were likewise variable, ranging from one or two individual specimens in the case of coral blocks and large gastropod molluscs, to plastic bags containing up to five litres of material (e.g. sea-urchins and chitons).

DISCUSSION

Our observations on the sale of invertebrates in the Durban traditional medicine market substantially augment those of Cunningham and Zondi (1991), almost doubling the number of taxa known to be involved. Even so, there are a number of items which we did not encounter, but which have been recorded by others, including bloodworms (*umopho*) (*Arenicola* sp.), black corals (*isikhuni ngomile)* (Antipatharia), crabs, crayfish and mantis shrimps (*inkalankala)* (Cunningham & Zondi 1991), blister beetles (*ibhungezi*) (*Mylabris* sp.) (Clark, Crouch & Ngwenya 1996), also known to be used in Venda traditional medicine (Arnold & Gulumian 1984), banded shrimps (*inkalankala)*, honey bee wax (*icina*) and paper wasp nests (*inyevu*) (McKean 1995).

Origin of the material

That much of the material for sale originates within the province is to be expected. The presence of a significant number of Mozambican species, however, indicates that there is also an international component to the trade. The traders themselves are not generally involved in the harvesting, but function primarily as a trade conduit between the gatherers and the healers (Mander 1998), although many sell some premixed medicinal preparations direct to consumers. Additional intermediaries may be involved, for example, material from Mozambique was often said to come via markets/dealers in Swaziland. These cross-border trade channels facilitate the international trade and are evidently well established, being utilised also for plant medicinals (Mander 1998).

It is conspicuous that the great majority of the invertebrates utilised are marine. This could simply be a result of Durban's coastal location, but this is evidently not the sole cause. Sea water and marine creatures are associated with coolness (Cunningham & Zondi 1991), an important characteristic in Zulu belief systems (Berglund 1976). They are also traditionally important in rain-making ceremonies of the Tsonga (Junod 1927), Zulu and Xhosa (pers. obs. F. Prins). Furthermore, some diviners are known to commune extensively with their water ancestors during divination, and this is reflected in their symbolic use of marine organisms. The fact that much of the marine material on sale originated well beyond the immediate vicinity of Durban (up to 2000 km away) is further evidence that local availability is not a major determinant with regard to the organisms used. Marine invertebrates belonging to similar groups are also used extensively in Chinese, Philippine and Korean traditional medicine (Tang 1987, Aliño *et al.* 1990, Chung *et al.* 2000).

Uses of the material

(a) Medicinal

Since we were not permitted to make enquiries regarding the specific medicinal uses to which the animal products were put, this issue became a secondary one. It is clear however, that usage centres on magico-medicinal properties considered inherent in the material. They are used by the *isangoma* (diviner), the *inyanga* (herbalist) and the *umthakathi* (sorcerer, witch) for many purposes, but generally more so in a ritualistic and symbolic context than for the curing or alleviation of somatic symptoms. They may be utilised, for example, to bring good fortune, as love charms, to imbue courage and strength, to ward off misfortune and to cast and counteract evil spells, or in rain-making rituals (see also Cunningham & Zondi 1991).

The products may be prepared in a variety of ways, as liquids (e.g. *ubulawu* and *intelezi*) or ground up into powders (e.g. *insizi*), often having previously been burned (Ngubane 1977). The way in which the final potion is administered also varies greatly, including amongst others, oral ingestion, enema, rubbing into incisions in the skin, smoke inhalation, and a multitude of ritualistic practices, many not requiring the medicines to be administered internally or externally to the patient/client. The topic is a complex one and has been discussed in general terms by a number of authors (Berglund 1976, Ngubane 1977, Hammond-Tooke 1989). We are not in a position to add significantly to knowledge regarding the medicinal use of these products and the subject is only mentioned subsequently when relevant to other issues.

It is noteworthy that many of the marine species listed in Table 1 belong to groups that have proven to be rich in bioactive natural products, namely sponges, cnidarians, molluscs, echinoderms and tunicates (Ireland *et al.* 1988, Mayer 1999, Fingerman & Nagabhushanam 2001, Higa *et al.* 2001, Olivera & Cruz 2001).

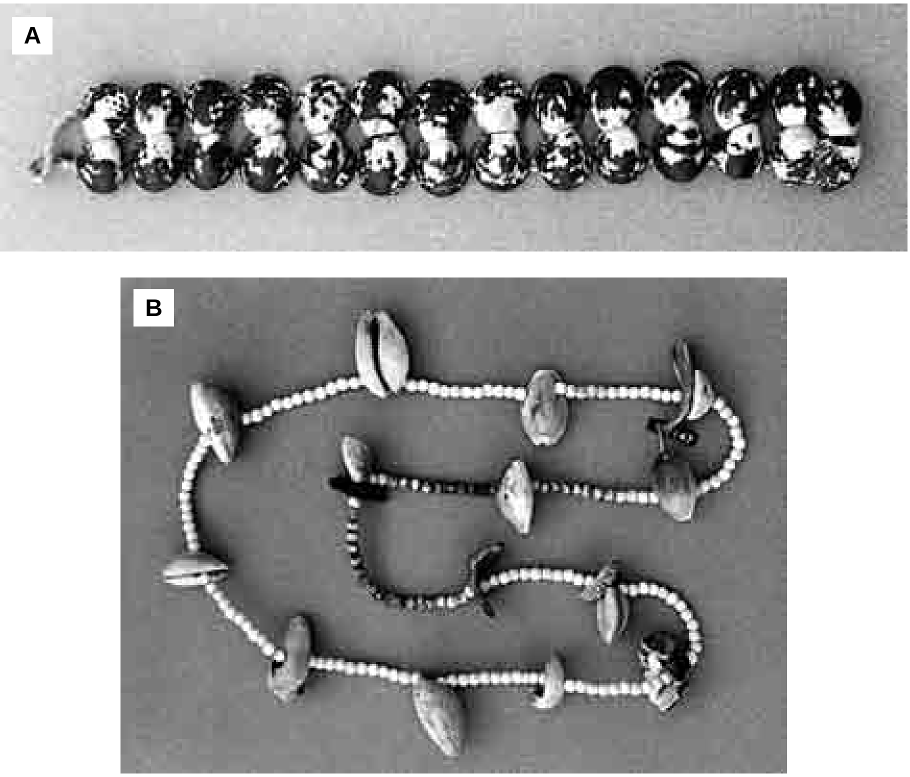

Fig. 3. Traditional healer’s regalia. A, wrist-band from Pondoland made from shells of the gastropod *Nerita albicilla* (the black and white coloration symbolising the black and white components of many traditional remedies); B, diviner’s necklace with glass beads and marine shells, Mtubatuba area, Zululand (Natal Museum 7147).

(b) Use in regalia worn by healers and in divining sets

Animal-derived products play an important role in the traditional attire worn by healers in south-eastern Africa (Berglund 1976) and a number of items of this nature made from, or including invertebrates were observed on sale in the market. Most common were small wrist-bands consisting of empty shells of the abundant intertidal gastropod *Nerita albicilla* Linnaeus, 1758, strung together on string in two parallel rows (Fig. 3A). These bracelets reportedly originated mostly from the former Transkei. A similar bracelet was illustrated by Berglund (1976). Also for sale were head-bands comprising 4–5 rows of *Cypraea annulus* shells stitched close together onto strips cut from woven plastic grain sacks (Fig. 1B). These were of Mozambican origin.

The ethnological collections in the Natal Museum contain several additional pieces of healers’ regalia, including necklaces (Fig. 3B) composed of glass beads interspersed with shells of marine gastropods (Architectonicidae, Conidae, Cypraeidae, Muricidae, Naticidae), bivalves (Carditidae and Ostreidae) and pencil-urchin spines [*Heterocentrotus mammillatus* (Linnaeus, 1758)].

Divining sets (*amathambo*) used by isangoma (diviners) may also contain things other than the traditional astragalus (ankle) bones and dice (Plug 1987), including marine gastropods. Junod (1927) has discussed in detail the ‘bone throwing’ (astragalomancy) practices of the Tsonga, and noted the importance of sea-shells, particularly species of *Oliva* and *Cypraea*, signifying male and female attributes respectively. Species of *Conus*, some superficially similar to *Oliva*, may also be used in this regard (Plug 1987).

The consistent use of particular animal parts or products within the healers’ regalia is sometimes based on symbolic associations. The choice of *Nerita albicilla* shells in wrist-bands for example, is quite deliberate, their black and white coloration reportedly representing the ‘black’ and ‘white’ components often combined in traditional medical remedies (Ngubane 1977).

Resource economics

Although it may be naïve to hope to acquire exemplary data relating to product values and consumption levels under such informal but nonetheless complex conditions, we do not believe that we can make meaningful comments on the economics of the resource, based on the data at hand. The issue is further complicated by the fact that animal products are often sold together with a range of other natural products in prepared mixtures (e.g. *nyamazane*, Cunningham & Zondi 1991) or potions, which may contain only small quantities of each of the animal-derived ingredients. It is the entire preparation for which a customer is charged, not its individual components. To obtain unitary prices for materials used in this manner is problematic. We thus restrict ourselves to some brief comparative remarks regarding product prices.

With a retail price of circa R300–500/kg, the most expensive invertebrate products (*Spirula* shells, chitons and pill millipedes) compare with highly valued plant products, such as wild ginger (*Siphonochilus aethiopicus* (Schweinf.) B.L. Burtt; Zingiberaceae) at R450/kg, the most highly priced plant product in the market (Mander 1998). However, whereas most of the invertebrate material was sold dry, much of the plant material is sold wet, and the figures are thus not truly comparable. Further investigation is needed to establish whether the high values of these items are genuinely indicative of highly valued products or merely a reflection of the small size and light weight of the dry material. In reality, if only small quantities of invertebrate products are used, the purchaser’s actual financial outlay may be small, as reflected by the unit price of the products (generally less than R5.00). In comparison with sought-after vertebrate products, prices for invertebrates are low. Rhinoceros horn reportedly sells for R2 500–5 000/kg (pers. obs. M. Mander).

Conservation concerns

Conservation concerns focus primarily on those species which were collected alive (Table 1). There need be little concern where the material is obviously derived from dead animals, e.g. cuttlebones, beach worn coral blocks, empty gastropod shells and beach-drift debris. Live-collected material is divisible into two types. Firstly that obtained as by-catch from unrelated enterprises and secondly, that specifically harvested for the traditional medicine trade from wild populations. Much animal material in the market evidently originates as fishing industry by-catch, evidenced by the abundance of dried marine fish species, particularly bottom-dwelling elasmobranchs. We strongly suspect that some invertebrate taxa, e.g. gorgonians, sponges, fasciolariid whelks and basket stars (*Astrocladus*), also come chiefly from this source. These animals are often brought up in large numbers attached to demersal trawl nets (pers. obs. D. Herbert). Since most undoubtedly die as a result of being uprooted and damaged by the trawl net (by-kill is perhaps a more appropriate term than by-catch), their subsequent utilisation in the traditional medicine trade merely serves to provide a use for some of this otherwise discarded material. The fraction used as traditional medicine, however, must be proportionally very small and any concerns regarding the conservation of the taxa involved should obviously be directed at the fishing industry.

Having eliminated the dead-collected and by-catch material as conservation concerns, the only material remaining is that which is collected alive and specifically—but not necessarily exclusively—for the traditional medicine trade. The number of species involved is considerably reduced and involves only the cnidarians (few), echinoderms (most), chitons, octopus, red-bait and millipedes.

(a) Cnidarians

Whereas the samples of the scleractinian corals *Pocillopora*, *Favites* and *Porites* were obviously beach-worn, those of the stoloniferan *Tubipora musica* were often in fresher condition and may have been collected alive. Although widespread in the Indo-West Pacific, this species is nowhere common on the east African coast (Schleyer pers. com.). Since it was one of the more commonly available items for sale, the way in which it is harvested warrants further study. At least some of this material originated in northern Mozambique (Nacala area). Only a single, small specimen, perhaps live-collected, of the mushroom coral *Fungia* was observed on sale. This probably represents an example of the opportunistic utilisation of any marine creatures of unusual appearance, when availability allows.

(b) Echinoderms

With the exception of the sea-urchins *Diadema* and *Echinometra*, most of the live-collected echinoderm material on sale originated from Mozambique. Species such as *Protoreaster lincki* and *Echinodiscus bisperforatus* (Leske, 1778) are inhabitants of sheltered meadows and sandflats (respectively) at the subtidal fringe (Bentley & Cockcroft 1995, Kalk 1995). Under pristine conditions, they may be collected with ease, but such habitats are now often heavily exploited in Mozambique and few sites are officially protected. Even in those sites that are protected, the efficacy of the protection is questionable (Schleyer pers. com.). The above notwithstanding, it should be noted that these species are also collected for sale as marine curios and that, with increasing tourism in Mozambique, more may be collected for this purpose than for the traditional medicine trade.

Diadema species and *Echinometra mathaei* (de Blainville, 1826) occur on most rocky shores from the former Transkei northwards, *E. mathaei* being the most common urchin in intertidal rock pools along the KwaZulu-Natal coast (Branch *et al*. 1994).

(c) Molluscs

Of the three chiton taxa recorded for sale, one, *Onithochiton literatus*, is abundant in the low intertidal zone on rocky shores of KwaZulu-Natal and is also consumed as a food item by subsistence gatherers in rural areas (Kyle *et al*. 1997). The much larger *Dinoplax* species are likewise common, but are of more cryptic habit. They are used also by fishermen as bait. Any consideration of the impact of harvesting these species for use as traditional medicines must also take these other uses into account.

The third species, *Chiton salihafui*, is far less common and represents, at least in a South African context, a more obvious conservation concern. The species ranges along the east African coast as far north as Somalia and reaches the southern limit of its distribution in northern Zululand. It was described only as recently as 1972 and it remains poorly known. No published information is available regarding its abundance on the east African coast. The only known colony of any size occurring in South Africa is that at Black Rock, Maputaland. This appeared relatively healthy in the late 1980s to early 1990s (pers. obs. D. Herbert), but had become much depleted by 1995 (Kyle *et al*. 1997) and the species has now been flagged as a conservation concern. It inhabits the mid to upper intertidal zone and is thus accessible to subsistence gatherers at most low tides. Since the traditional medicine traders evidently do not distinguish between this and the similarly sized *O. literatus*, one can presume that they are regarded as the same or at least equivalent. Conservation of local populations of *C. salihafui* may thus be partially addressed by explaining the predicament to gatherers and asking them to collect chitons only on the lower part of the shore, thus restricting harvesting to the much more abundant *O. literatus*. The status of populations of *C. salihafui* in neighbouring Mozambique is not known. Whilst it is quite possible that some *C. salihafui* material for sale in the Durban market originated from Mozambique, it is known that some invertebrates, including chitons, harvested in Maputaland are sold to the traditional medicine trade (Kyle *et al*. 1997). Cunningham and Zondi (1991) also record the use of *Ischnochiton oniscus* as a traditional medicine, but like *O. literatus*, this species is widespread and common on the eastern seaboard.

Few octopus specimens were seen for sale and any assessment of the impact of the utilisation of octopods in the traditional medicine trade needs to take into consideration their use as food and bait items.

(d) Red-bait

The tunicate *Pyura stolonifera*, commonly known as red-bait, was identified as one of the more frequently utilised items. It is, however, available in abundance on most open rocky coasts in South Africa (Branch *et al*. 1994). It is used extensively as both bait and food.

(e) Pill millipedes

Although the number of stalls selling pill millipedes was relatively small, the quantity in stock was often large. At the start of our study, estimated numbers of pill millipedes on the three stalls which sold them ranged from 100–500 per stall (although this was reduced to zero approximately two months later). These belonged to two species, both largely restricted to forest habitats, *Sphaerotherium giganteum* Porat, 1872, a widespread eastern seaboard species, and an as yet unidentified species of *Sphaerotherium* from the coast of KwaZulu-Natal, north of Durban. No estimates of population densities

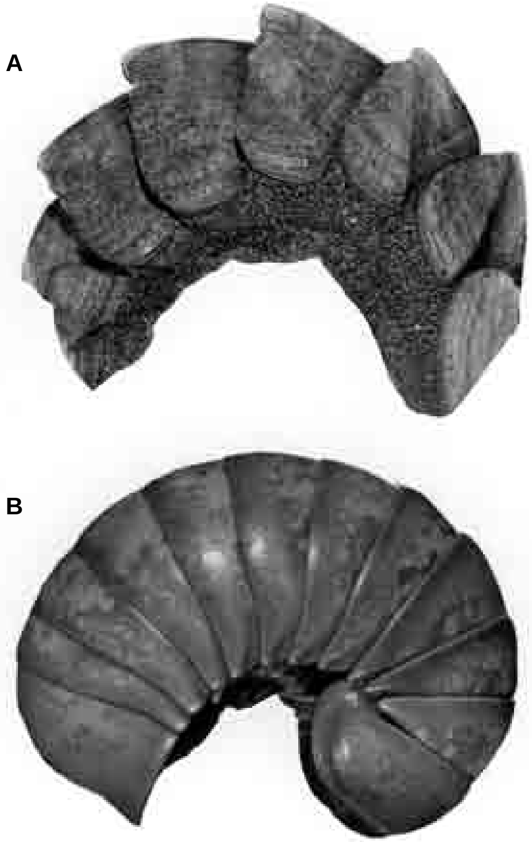

Fig. 4. Traditional nomenclature - *imfinyezi*. A, a chiton *imfinyezi yasolwandle* (*Dinoplax* sp.) and B, a pill millipede *imfinyezi yentaba* or *imfinyezi yangaphandle* (*Sphaerotherium* sp.), showing the superficially similar shape and body segmentation.

exist for South African pill millipedes, and there are no data on growth rate and life span. Without such data and more accurate figures of harvesting and usage rates, it is impossible to assess the impact of the traditional medicine trade on the conservation of these species.

Traditional nomenclature, classification and symbolisms

The derivation of the Zulu names for the animals used is sometimes obvious, for example when the term is descriptive, highlighting a particularly prominent feature of the animal. The pansy shell (*Echinodiscus bisperforatus*), on account of its very flat, disk-like shape, is known as *ipuleti lasolwandle,* literally ‘the plate of the sea’. Starfish (e.g. *Protoreaster lincki*) are *inkanyezi yasolwandle*, ‘the star of the sea’, for obvious reasons. The origin of other names, however, is far less clear, and may be an interesting subject for further ethnological research. Why, for example, are cuttlebones (*Sepia*) known as *amasimbenyanga*, literally ‘the faeces of the moon’?

Revealed in the analysis of the Zulu names for the animals are examples of indigenous or folk classifications, differing substantially from the scientifically accepted zoological ones, yet showing alternative cultural insight. An example concerns the use of the term *imfinyezi* for both pill millipedes and chitons, pill millipedes being *imfinyezi yentaba* (of the mountains) or *imfinyezi yangaphandle* (of nature) and chitons being *imfinyezi yasolwandle* (of the sea). Modern zoological classification would certainly not group these animals together, but there are shared morphological features and behavioural traits, notably the division of the exoskeleton into segments or plates (valves) and the defensive curling up of the body (Fig. 4), which could, under a different value system, lead to them being grouped together. Evidently this defensive behaviour is also linked to the medicinal uses of these animals, viz. to cause vaginal spasm in women (Cunningham & Zondi 1991) and prevent bed wetting in children (healer pers. com.). The link is a symbolic one, associating the animal's ability to curl up tightly with the contraction of sphincter muscles in humans.

Similar symbolisms are evident in Korean traditional medicine where centipedes, with their numerous legs, are used to treat disorders associated with limbs (Pemberton 1999). Such symbolisms can also be invoked when a healer is called upon to reverse a given behaviour. Berglund (1976) recorded the use of *imfinyezi* (pill millipedes) in medicines given to dogs which sleep excessively—evidently the millipede is used to symbolise the sleeping, curled-up dog—the other ingredients in the remedy acting upon this in order to reverse the undesirable behaviour. Similarly in Korean traditional medicine, scorpions whose stings cause pain, and *Mylabris* beetles whose secretions cause blistering of the skin, are used to treat pain and skin diseases respectively (Pemberton 1999).

Another example of an alternative, non-zoological grouping concerns the association of juliform millipedes (*isongololo*) with the cephalopod *Spirula spirula* (*isongololo laseolwandle*)—the similarity between the shell of *Spirula* (Fig. 5A) and a coiled up millipede (Fig. 5B) is obvious.

The above examples are also of interest from a nomenclatural perspective. The word *imfinyezi*, itself of no apparent meaning, is equivalent to a generic name (Berlin 1973, 1992) and the qualifying epithet, in this case indicative of the origin of the animal, is adjectival and equivalent to the specific name. Such binomial rubrics are commonly used when folk genera are polytypic. (As Berlin (1992) has pointed out, those who credit Linnaeus with inventing the binomial system of nomenclature, are perhaps guilty

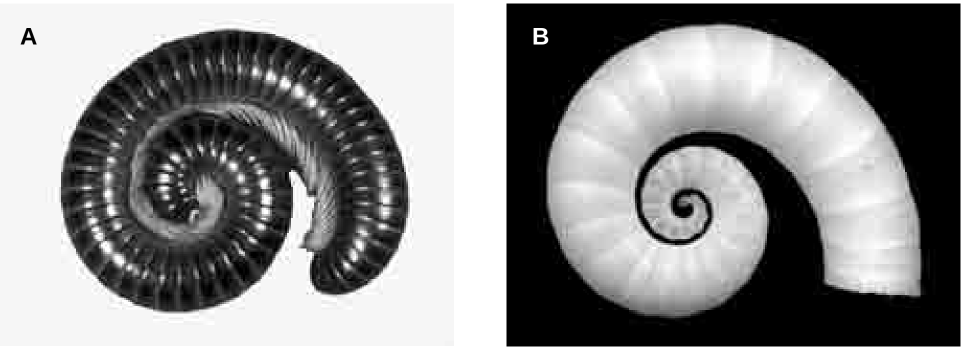

Fig. 5. Traditional nomenclature - *isongololo*. A, *isongololo*, the well-known juliform millipedes and B, *isongololo lasolwandle*, the shell of the cephalopod mollusc *Spirula spirula*.

of unintentional ‘western systematic ethnocentrism’.) In contrast, the term *isongololo* is used as a monomial name for juliform millipedes. Two names, *isongololo laseolwandle*, are given only for *Spirula spirula*, indicating its marine origin. Monomial names are typically used when one particular taxon within a folk genus is well known (as are the large juliform millipedes in southern Africa) or of major cultural significance (Berlin 1973 1992). Such names are regarded as prototypical and are equivalent to the type species of classical taxonomy, comparable perhaps with nomenotypical taxa or tautonymous binomina e.g. *Aus aus* or *Bus bus* (cf. ICZN 1999).

CONCLUSION

The traditional medicine trade is a dynamic one. Although the data presented here for invertebrates represent the most comprehensive inventory compiled to date for these taxa in the southern African trade, they are based on a relatively short-term survey and the list would certainly grow if the market was monitored over a longer time. Product availability is clearly variable and the influence of the activities of the gatherers on this is considerable. Nonetheless, a number of products appear to be traditional staples and are readily available for much of the time. These include such things as coral blocks, cuttlebones, sea-shells, chitons, achatinid land snails, sea-urchins, starfish and red-bait, many of which were reported also by Cunningham and Zondi (1991). Some products are available episodically, if and when the gatherers encounter an abundant source. This is likely to be particularly so for terrestrial invertebrates, for which seasonal changes in abundance will frequently be greater. As a result they may appear for sale in quantity for a time and subsequently disappear when stocks are depleted, as happened with pill millipedes during this study. The trade is also dynamic in terms of the healers’ willingness to use new products, should these become available, particularly if they are unfamiliar or of bizarre appearance (as perhaps was the case for the mushroom coral specimen).

The use of animal products in the traditional medicine trade (particularly vertebrates) is a controversial subject, and concern has been expressed regarding its effect on wild populations and Red Data species, if it remains poorly managed (Macdonald 1984, Simelane & Kerley 1998). Although attempts to quantify utilisation levels in the present study were not successful, it is noteworthy that many of the species collected alive specifically for the traditional medicine trade are common or abundant in the region. However, we draw attention to a number of cases which are worthy of further consideration, including *Chiton salihafui* in Zululand, the large tropical echinoderms from sheltered habitats in Mozambique and the coral *Tubipora musica*. Nevertheless, in these cases the material is not harvested for the medicine trade alone and consumption levels related to other uses (e.g. subsistence food and curio trade) must also be considered. The situation with regard to the pill millipedes remains something of an enigma that cannot be resolved until the taxonomy and distribution of the species concerned have been studied more thoroughly and the extent of their usage further investigated.

While our observations indicate that many of the animals collected alive for use in the trade are common or abundant species, and are thus not issues of obvious and immediate conservation concern, this should ideally be corroborated with quantitative data. Similarly, it should not be extrapolated to include the use of vertebrate products. Judging from our own observations in the Durban market and those of others elsewhere in southern Africa, vertebrate utilisation is extensive

(Cunningham & Zondi 1991, McKean 1995, Bossard 1996, Simelane 1996, Derwent & Mander 1997, Simelane & Kerley 1998, White, Cocks, Herbert & Hamer in prep.) and significant numbers of the species involved are red-listed. This remains a subject in need of further study, particularly from the perspective of sustainability and resource economics, but one which is likely to be beset with logistical problems. The difficulties associated with obtaining reliable data in the market are often considerable and the concerns of the traders would need to be taken very seriously and handled with sensitivity.

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